



The Parker Ranch installation in Hawaii

## Overcoming Common Pitfalls: Energy Efficient Lighting Projects

### Presenters:

Heidi Steward, LC Pacific Northwest National Lab  
Jeffrey Schwartz, LC, IES ICF International

October 21, 2010

DOE's Technical Assistance Program (TAP) supports the Energy Efficiency and Conservation Block Grant Program (EECBG) and the State Energy Program (SEP) by providing state, local, and tribal officials the tools and resources needed to implement successful and sustainable clean energy programs.



## TAP offers:

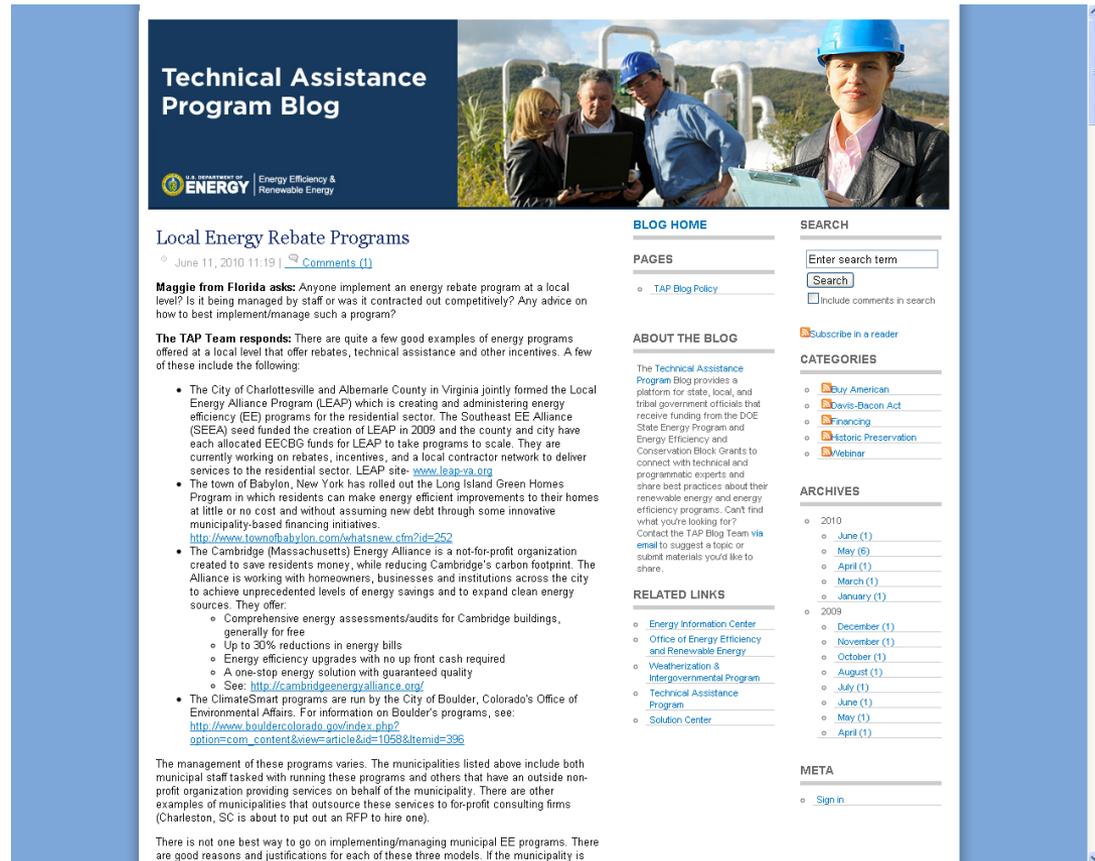
- One-on-one assistance
- Extensive online resource library, including:
  - Webinars
  - Events calendar
  - TAP Blog
  - Best practices and project resources
- Facilitation of peer exchange

## On topics including:

- Energy efficiency and renewable energy technologies
- Program design and implementation
- Financing
- Performance contracting
- State and local capacity building

## Access the TAP Blog! <http://www.eereblogs.energy.gov/tap/>

Provides a platform for state, local, and tribal government officials and DOE's network of technical and programmatic experts to connect and share best practices on a variety of topics.



**Technical Assistance Program Blog**

U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy

### Local Energy Rebate Programs

June 11, 2010 11:19 | [Comments \(1\)](#)

**Maggie from Florida asks:** Anyone implement an energy rebate program at a local level? Is it being managed by staff or was it contracted out competitively? Any advice on how to best implement/manage such a program?

**The TAP Team responds:** There are quite a few good examples of energy programs offered at a local level that offer rebates, technical assistance and other incentives. A few of these include the following:

- The City of Charlottesville and Albemarle County in Virginia jointly formed the Local Energy Alliance Program (LEAP) which is creating and administering energy efficiency (EE) programs for the residential sector. The Southeast EE Alliance (SEEA) seed funded the creation of LEAP in 2009 and the county and city have each allocated EECBG funds for LEAP to take programs to scale. They are currently working on rebates, incentives, and a local contractor network to deliver services to the residential sector. LEAP site- [www.leap-va.org](http://www.leap-va.org)
- The town of Babylon, New York has rolled out the Long Island Green Homes Program in which residents can make energy efficient improvements to their homes at little or no cost and without assuming new debt through some innovative municipality-based financing initiatives. <http://www.townofbabylon.com/whatsnew.cfm?id=252>
- The Cambridge (Massachusetts) Energy Alliance is a not-for-profit organization created to save residents money, while reducing Cambridge's carbon footprint. The Alliance is working with homeowners, businesses and institutions across the city to achieve unprecedented levels of energy savings and to expand clean energy sources. They offer:
  - Comprehensive energy assessments/audits for Cambridge buildings, generally for free
  - Up to 30% reductions in energy bills
  - Energy efficiency upgrades with no up front cash required
  - A one-stop energy solution with guaranteed quality
  - See: <http://cambridgeenergyalliance.org/>
- The ClimateSmart programs are run by the City of Boulder, Colorado's Office of Environmental Affairs. For information on Boulder's programs, see: [http://www.boulder.colorado.gov/index.php?option=com\\_content&view=article&id=1058&Itemid=336](http://www.boulder.colorado.gov/index.php?option=com_content&view=article&id=1058&Itemid=336)

The management of these programs varies. The municipalities listed above include both municipal staff tasked with running these programs and others that have an outside non-profit organization providing services on behalf of the municipality. There are other examples of municipalities that outsource these services to for-profit consulting firms (Charleston, SC is about to put out an RFP to hire one).

There is not one best way to go on implementing/managing municipal EE programs. There are good reasons and justifications for each of these three models. If the municipality is

**BLOG HOME**

**PAGES**

- [TAP Blog Policy](#)

**ABOUT THE BLOG**

The Technical Assistance Program Blog provides a platform for state, local, and tribal government officials that receive funding from the DOE State Energy Program and Energy Efficiency and Conservation Block Grants to connect with technical and programmatic experts and share best practices about their renewable energy and energy efficiency programs. Can't find what you're looking for? Contact the TAP Blog Team via email to suggest a topic or submit materials you'd like to share.

**RELATED LINKS**

- [Energy Information Center](#)
- [Office of Energy Efficiency and Renewable Energy](#)
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- [Technical Assistance Program](#)
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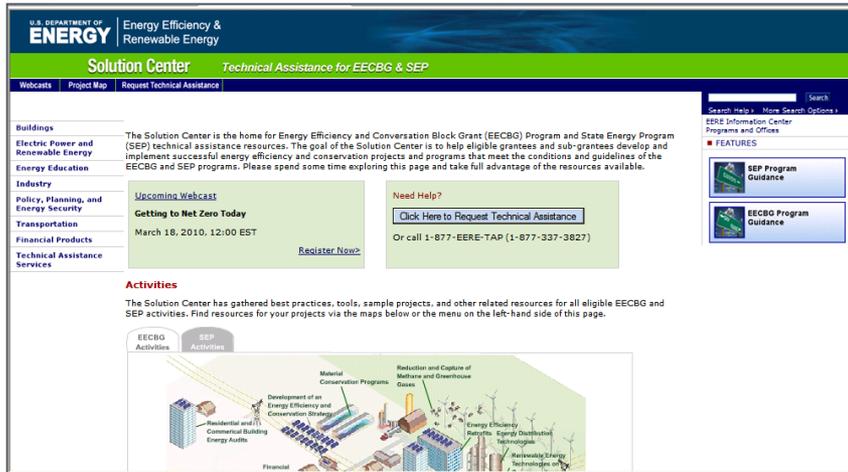
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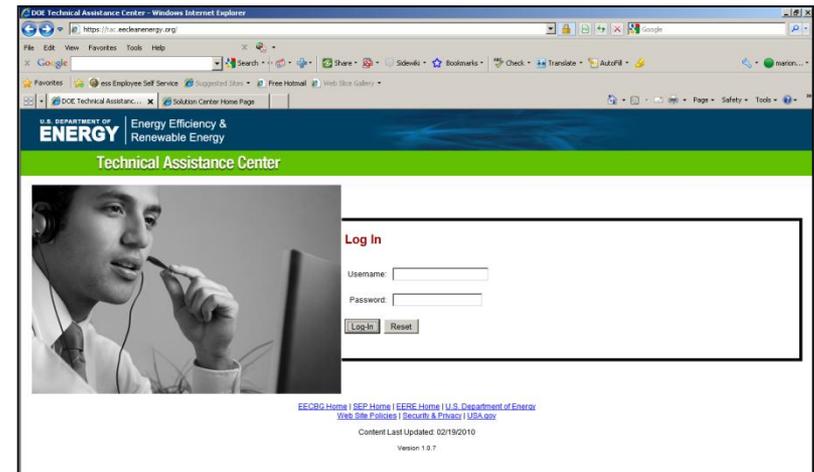
## We encourage you to:

1) Explore our online resources via the [Solution Center](#)

2) Submit a request via the [Technical Assistance Center](#)



The screenshot shows the 'Solution Center' website for Energy Efficiency & Renewable Energy. The header includes the U.S. Department of Energy logo and the text 'Energy Efficiency & Renewable Energy'. Below the header, there are navigation tabs for 'Webcasts', 'Project Map', and 'Request Technical Assistance'. The main content area is divided into several sections: 'Buildings' with a description of the Solution Center's purpose; 'Energy Education' with a link to 'Upcoming Webcast'; 'Transportation' with a link to 'Getting to Net Zero Today'; 'Technical Assistance Services'; and 'Activities' with a description and a diagram showing various energy efficiency and conservation strategies. A 'Need Help?' section with a 'Click Here to Request Technical Assistance' button is also visible.



The screenshot shows the 'Technical Assistance Center' website for Energy Efficiency & Renewable Energy. The header includes the U.S. Department of Energy logo and the text 'Energy Efficiency & Renewable Energy'. Below the header, there are navigation tabs for 'Webcasts', 'Project Map', and 'Request Technical Assistance'. The main content area features a 'Log In' section with fields for 'Username' and 'Password', and 'Log In' and 'Reset' buttons. A 'Need Help?' section with a 'Click Here to Request Technical Assistance' button is also visible. The footer includes links to 'EERE Home', 'SEP Home', 'EERE Home | U.S. Department of Energy', 'Web Site Policies | Security & Privacy | USA.gov', and 'Content Last Updated: 02/19/2010'.

3) Ask questions via our call center at 1-877-337-3827 or email us at [solutioncenter@ee.doe.gov](mailto:solutioncenter@ee.doe.gov)

# Heidi Steward, LC Pacific Northwest National Lab

Part I: Lighting Technology Overview

- Sources:
  - HID
  - Low pressure discharge (e.g., fluorescent)
  - SSL
- Controls
  - Time-based
  - Daylight-based
  - Occupancy-based
  - Individual Addressability
- Other
  - Reliability & Maintenance
- Additional Resources

**Presented by Heidi Steward, LC  
Pacific Northwest National Laboratory  
Research Engineer**

- High-Intensity Discharge Lamps
  - Dominant source in outdoor lighting
  - Different from other sources
  - Long-established technology
- HID Lamps include:
  - Mercury Vapor (MV)
  - High-Pressure Sodium (HPS)
  - Metal Halide (MH)
- Often associated:
  - Low-Pressure Sodium (LPS)



- (Low Pressure) Discharge Lamps
  - Limited applications in outdoor lighting
  - Most lamps affected by temperature
  - Established technology
- Include:
  - Low-Pressure Sodium (LPS) - often associated with HID
  - Linear fluorescent (FLUOR)
  - Compact fluorescent (CFL)
  - Induction (IND)



- Solid-State Lighting (SSL)
  - Light-Emitting Diodes (LEDs)
  - Organic Light-Emitting Diodes (OLEDs)
  - Quantum Dots
- New and most promising source category
- Not like conventional lighting
  - No electrodes
  - No filament



- Time-Based
  - Astronomical Timeclock
  - Time-of-day use
- Daylight-Based
  - Photocell
  - Daylight Dimming



- Occupancy-Based
  - Infrared
  - Ultrasonic
  - Microwave (high frequency)
- Individuality
  - Provides Information
  - Safety Aspects





LED Luminaire High Output 149W  
Operated: 55% of the time  
PG&E Emerging Technologies  
Program, 2009, Report #0815



LED Luminaire Low Output 52W  
Operated: 45% of the time  
PG&E Emerging Technologies  
Program, 2009, Report #0815

- Reliability (Discharge)
  - HID
  - Low Pressure Discharge
- Reliability (LED)
  - Lamp Lumen Depreciation (LLD)
  - End-of-life verification
- Maintenance
  - Luminaire Dirt Depreciation
  - Cleaning Luminaires

- HID Determination
- [http://www1.eere.energy.gov/buildings/appliance\\_standards/commercial/high\\_intensity\\_discharge\\_lamps.html](http://www1.eere.energy.gov/buildings/appliance_standards/commercial/high_intensity_discharge_lamps.html)
- DOE SSL
  - Homepage
    - <http://www1.eere.energy.gov/buildings/ssl/>
  - Research & Development Homepage
    - <http://www1.eere.energy.gov/buildings/ssl/projects.html>
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    - <http://www1.eere.energy.gov/buildings/ssl/market.html>
  - CALiPER Program
    - <http://www1.eere.energy.gov/buildings/ssl/caliper.html>
  - GATEWAY Demonstrations Program – Raley's
    - <http://www1.eere.energy.gov/buildings/ssl/gatewaydemos.html>
    - [http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway\\_raleys.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_raleys.pdf)

# Jeffrey Schwartz, LC, IES, ICF International Lighting Technical Specialist

Part II: Outdoor Lighting

## Common Outdoor Lighting Grant Proposals

- Traffic Signals
- Parking Garages
- Street Lighting

## Common Issues and Concerns

- The Project Goal
- The Technology
- Meeting Desired Results

## Energy Savings vs. Other Goals

- Safety and security
- Reduce vehicular accidents
- Improve pedestrian visibility
- Increase commerce
- Create a particular “look” or “style”
- Illuminate building facades and architectural details
- Respond to public demand

## Energy Savings vs. Other Goals

- Energy – understand the tariff structure
  - Per Unit
  - Per Intersection
  - Metered
- Maintenance – real savings possible
  - Product Life
  - Existing Contracts
  - Contract Modifications

## What Needs To Be Known

- Applicable Codes
- Product Standards
- Light Levels, Ratios, etc.

## No One Technology Is Right for Every Application:

- In most cases there is more than one option
- Always clarify WHY the suggested technology is the right one for YOUR application
- Manufacturer claims vs. supporting documentation

## The “Standard” or “List”

- National Product Standards
- ENERGY STAR Qualified
- Design Lights™ Consortium Qualified Product Lists – LED Products
- What standards were used for testing

# Outdoor Lighting - Applications



Progress Energy



- Proven Technology (LED)
- ENERGY STAR label retired
- Federal Standards exist – reference them
- Understand tariff structure
- Consider maintenance savings as well as maintenance contracts
- LED cross walk signs (hand/man)



## Resources

- DOE Federal Standards
- Manual on Uniform Traffic Control Devices (U.S. Dept. of Transportation)
- State Codes or Regulations
- Lighting Research Center – Life Cycle Cost Analysis (NYSERDA traffic Signals)



<http://www.lrc.rpi.edu/programs/transportation/led/nystrafficsignals.asp>

- LED working well WHEN proper fixture and location are chosen
- Not always a simple one-for-one; need to work with vendor/manufacturer
- Careful analysis – high performance T8 may be an alternative option - compare
- Rated life – require testing, compare results
- Warranty? Established Company
- Light levels – entrance, exit, turn lanes, ambient levels - IES Recommendations



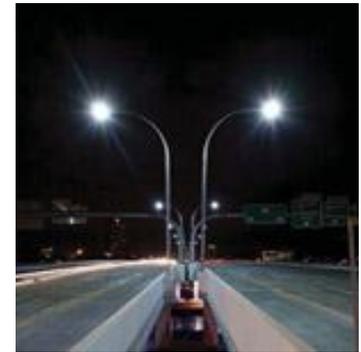
Table 1:

	Minimum Horizontal (measured in foot-candles)	Horizontal Uniformity Maximum/ Minimum	Minimum Vertical* (measured in foot-candles)
<b>Basic</b>			
	1	10:1	.5
<b>Ramps</b>			
Day	2	10:1	1
Night	1	10:1	.5
<b>Entrance Areas</b>			
Day	50		25
Night	1	10:1	.5
<b>Stairways</b>			
	2		1
*Measured facing the drive aisle at 5 feet above the parking surface at the point of the lowest horizontal illuminance.			



## Resources

- IES Lighting Recommendations
- DOE still working on test procedures, currently no ENERGY STAR specifications or list
- DOE Gateway Study (DOL parking garage)
- Design Lights™ Consortium  
Qualified Product List



- What are you lighting
- Why are you lighting it
- Urban, suburban, rural
- Federal standards for roadway
- IES recommendations
- Understand tariff structure
- Consider maintenance savings as well as maintenance contracts



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- Light Trespass - Light Pollution
- Glare Issues
- State Codes - Local Codes
- Number of Poles
- Number of Fixtures per Pole
- Light Levels
- Light Ratios (uniformity)



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- Style and Finish
- Light Source – LED, Pulse-start metal halide, induction, other
- Initial Light Level vs. Maintained Lumens
- Public Reaction
- Test Area?

## Resources

- IES Lighting Recommendations RP16
- DOE still working on test procedures, currently no ENERGY STAR specifications or list
- DOE Gateway Studies
- Design Lights™ Consortium  
Qualified Product List
- NYSERDA *How-to Guide to Effective Energy-Efficient Street Lighting*
- LRC National Lighting Product Information Program (NLPIP) New Street Lighting Issue

## Please join us again:

Title: **Tips and Tools for Promoting Your Energy-Efficiency Project**

Host: Nancy Raca, ICF International and Jim Arwood, NASEO

Date: October 22, 2010

Time: 12:00-1:00 EDT

Title: **Quality Assurance for Residential Retrofit Programs**

Host: David Keefe and Jim Grevatt, VEIC

Date: October 26, 2010

Time: 2:00-3:00 EDT

Title: **RETScreen Training 101**

Host: Sarah Busche and Jimmy Jones, NREL

Date: October 27, 2010

Time: 3:00-4:15 EDT

Title: **Benchmarking Your Building's Energy Using EPA's ENERGY STAR Portfolio Manager**

Host: Peter Flippen, ICF International

Date: October 28, 2010

Time: 12:00-1:00 EST

Title: **Designing Effective Incentives to Drive Residential Retrofit Program Participation**

Host: Richard Faesy, EFG

Date: October 29, 2010

Time: 2:00 - 3:00pm EDT

Title: **Driving Demand: Working With and Learning from Contractors**

Host: Merrian Fuller, LBNL

Date: November 9, 2010

Time: 2:00 - 3:15pm EST

Title: **EM&V 101: General Approaches to Tracking Data and Estimating Savings**

Host: Julie Michals, NEEP

Date: November 10, 2010

Time: 2:00 - 3:00pm EST

For the most up-to-date information and registration links, please visit the Solution Center webcast page at [www.wip.energy.gov/solutioncenter/webcasts](http://www.wip.energy.gov/solutioncenter/webcasts)